

neck pivot pin level through a rigidly attached adaptor bracket as shown in Figure T5 according to the test procedure set out in paragraph (c) of this section:

(1) The lumbar spine-abdomen-chest flesh assembly shall flex by an amount that permits the upper torso assembly to translate in angular motion relative to the vertical transverse plane 35 ± 0.5 degrees at which time the force applied must be not less than 180 N (40.5 lbf) and not more than 250 N (56.2 lbf).

(2) Upon removal of the force, the torso assembly must return to within 8 degrees of its initial position.

(c) *Test Procedure.* The test procedure for the upper/lower torso assembly is as follows:

(1) Torque the lumbar cable (drawing 420–4130) (incorporated by reference, see §572.170) to 0.9 ± 0.2 N-m (8 ± 2 in-lbf) and set the lumbar adjustment angle to 12 degrees. Set the neck angle to 16 degrees.

(2) Soak the dummy in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(3) Assemble the complete dummy (with or without the legs below the femurs) and attach to the fixture in a seated posture as shown in Figure T5.

(4) Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼-inch cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic-lumbar joining surface is 18 degrees from horizontal and the legs are parallel with the test fixture.

(5) Attach the loading adaptor bracket to the spine of the dummy as shown in Figure T5.

(6) Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the chest flesh, assuring that the chest flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh.

(7) Flex the dummy's upper torso three times between the vertical and until the torso reference frame, as shown in Figure T5, reaches 30 degrees

from the vertical transverse plane. Bring the torso to vertical orientation and wait for 30 minutes before conducting the test. During the 30-minute waiting period, the dummy's upper torso shall be externally supported at or near its vertical orientation to prevent it from drooping.

(8) Remove all external support and wait two minutes. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy as shown in Figure T5. The initial orientation angle may not exceed 20 degrees.

(9) Attach the pull cable and the load cell as shown in Figure T5.

(10) Apply a tension force in the midsagittal plane to the pull cable as shown in Figure T5 at any upper torso deflection rate between 0.5 and 1.5 degrees per second, until the angle reference plane is at 35 ± 0.5 degrees of flexion relative to the vertical transverse plane.

(11) Continue to apply a force sufficient to maintain 35 ± 0.5 degrees of flexion for 10 seconds, and record the highest applied force during the 10-second period.

(12) Release all force at the attachment bracket as rapidly as possible, and measure the return angle with respect to the initial angle reference plane as defined in paragraph (c)(7) of this section three minutes after the release.

§572.176 Knees and knee impact test procedure.

(a) The knee assembly for the purpose of this test is the part of the leg assembly shown in drawing 420–5000 (incorporated by reference, see §572.170).

(b) When the knee assembly, consisting of lower upper leg assembly (420–5200), femur load transducer (SA572–S10, included in drawing 420–0000) or its structural replacement (420–5121), lower leg assembly (420–5300), ankle assembly (420–5400), and foot molded assembly (420–5500) (all incorporated by reference, see §572.170) is tested according to the test procedure in subsection (c) of this section:

(1) The peak resistance force as measured with the test probe-mounted accelerometer must not be less than 2.6

kN (585 lbf) and not more than 3.2 kN (719 lbf).

(2) The force shall be calculated by the product of the impactor mass and its deceleration.

(c) *Test Procedure.* The test procedure for the knee assembly is as follows:

(1) Soak the knee assembly in a controlled environment at any temperature between 20.6 and 22.2 °C (69 and 72 °F) and a relative humidity between 10 and 70 percent for at least four hours prior to a test.

(2) Mount the test material and secure it to a rigid test fixture as shown in Figure T6. No part of the foot or tibia may contact any exterior surface.

(3) Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur.

(4) Guide the pendulum so that there is no significant lateral, vertical, or rotational movement at the time of initial contact between the impactor and the knee.

(5) The test probe velocity at the time of contact shall be 2.1 ± 0.03 m/s (6.9 ± 0.1 ft/s).

(6) No suspension hardware, suspension cables, or any other attachments to the probe, including the velocity vane, shall make contact with the dummy during the test.

§572.177 Test conditions and instrumentation.

(a) The following test equipment and instrumentation is needed for qualification as set forth in this subpart:

(1) The test probe for thoracic impacts is of rigid metallic construction, concentric in shape, and symmetric about its longitudinal axis. It has a mass of 6.89 ± 0.012 kg (15.2 ± 0.05 lb) and a minimum mass moment of inertia of 2040 kg-cm^2 ($1.81 \text{ lbf-in-sec}^2$) in yaw and pitch about the CG. One-third ($\frac{1}{3}$) of the weight of the suspension cables and their attachments to the impact probe is included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis, is at least 25.4 mm (1.0 in) long, and has a flat, continuous, and non-deformable 121

± 0.25 mm (4.76 ± 0.01 in) diameter face with a maximum edge radius of 12.7 mm (0.5 in). The probe's end opposite to the impact face has provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. No concentric portions of the impact probe may exceed the diameter of the impact face. The impact probe has a free air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in the PADI (incorporated by reference, see §572.170).

(2) The test probe for knee impacts is of rigid metallic construction, concentric in shape, and symmetric about its longitudinal axis. It has a mass of 1.91 ± 0.01 kg (4.21 ± 0.02 lb) and a minimum mass moment of inertia of 140 kg-cm^2 ($0.124 \text{ lbf-in-sec}^2$) in yaw and pitch about the CG. One third ($\frac{1}{3}$) of the weight of the suspension cables and their attachments to the impact probe may be included in the calculation of mass, and such components may not exceed five percent of the total weight of the test probe. The impacting end of the probe, perpendicular to and concentric with the longitudinal axis, is at least 12.5 mm (0.5 in) long, and has a flat, continuous, and non-deformable 76.2 ± 0.2 mm (3.00 ± 0.01 in) diameter face with a maximum edge radius of 12.7 mm (0.5 in). The probe's end opposite to the impact face has provisions for mounting an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe. No concentric portions of the impact probe may exceed the diameter of the impact face. The impact probe has a free air resonant frequency of not less than 1000 Hz, which may be determined using the procedure listed in the PADI (incorporated by reference, see §572.170).

(3) Head accelerometers have dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 (included in drawing 420-0000) and are mounted in the head as shown in drawing 420-0000 (both incorporated by reference, see §572.170), sheet 2 of 6.

(4) The upper neck force and moment transducer has the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S11 (included in drawing 420-